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**Sampling and Analysis Plan/Quality Assurance Project Plan
Residential Drinking Water Well Sampling
North Highlands
Houston, Texas 77056**

Prepared For:

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1.0 Introduction

InControl Technologies developed the following Sampling and Analysis Plan for the Residential Drinking Water Well Sampling for Harris County Pollution Control Services. The scope of work was derived from the Request for Quotation and Work Plan submittal dated February 16, 2016. Based on the requirements stipulated in this section, the following plan was developed.

1.1 Project Background

Based on information obtained during the mandatory pre-bid meeting, the subject area was impacted with waste buried along the San Jacinto River from historical pulp and paper mill activity. The site consists of a set of three impoundments built in the mid-1960s for disposal of paper mill wastes, and surrounding areas containing sediments and soils potentially contaminated with the waste materials disposed of in the impoundments. In 1965 and 1966, Champion Paper Inc. transported pulp and paper mill wastes (both solid and liquid) to the site for unloading into the impoundments. The Champion Paper Mill used chlorine as a bleaching agent. Sampling discovered polychlorinated dibenzo-p-dioxins, polychlorinated furans (dioxins and furans), and some metals in wastes in the impoundments. Physical changes at the site in the 1970s and 1980s resulted in partial submergence of the impoundments north of Interstate 10 and exposure of the contents of the impoundments to surface waters.

Site activities to date have included a Time Critical Removal Action (TCRA), or installation of an armored cap, to address immediate threats to human health and the environment. The cap installation in 2011 stabilized the waste pits and prevented direct human and benthic contact with the waste materials. The U.S. Environmental Protection Agency (USEPA) has required the responsible parties to maintain the cap, as well as perform ongoing assessments, inspections and surveillance activities at and around the site. The USEPA has completed a remedial investigation for the site and in cooperation with the state, county, and local agencies is continuing to assess current and future site conditions to develop a comprehensive plan for site cleanup. Due to the close proximity of the site, concern was raised by area residents that groundwater used for potable water may be impacted with a variety of compounds including dioxins, furans and other synthetic organic compounds associated with the San Jacinto River Waste Pits.

InControl Technologies will sample, analyze, evaluate and report quality assured data for selected private drinking water wells in East Harris County near the intersection of I-10 and Crosby Lynchburg, west of Baytown. It is anticipated that the final number of wells sampled in this project will range from a minimum of forty (40) to as many as 100 based upon a survey and final inventory of wells compiled by Harris County. It is our understanding that the final tabulation of wells will be compiled by Harris County and will include signed access forms for each of target water well properties.

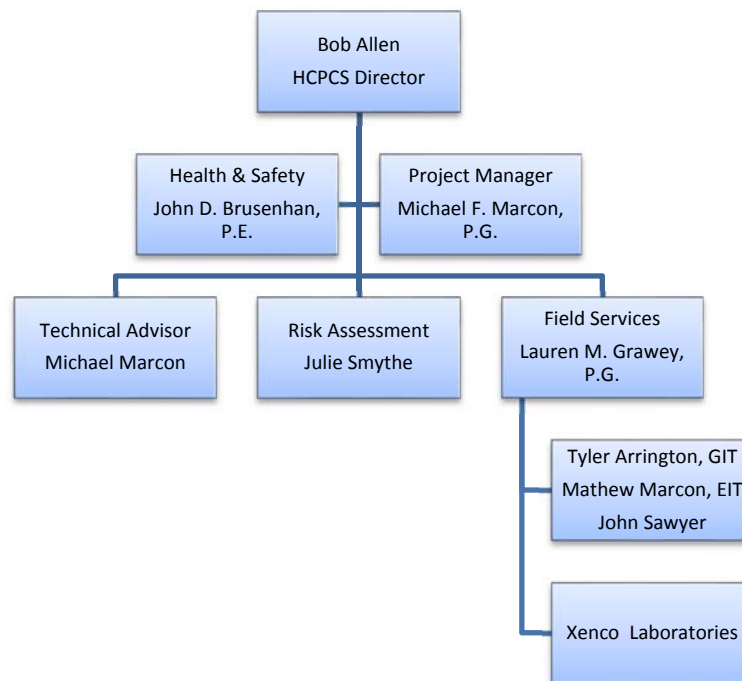
The wells to be sampled in this project are located in two (2) "project areas" within unincorporated Harris County and a portion of the 77562 and 77520 zip codes. The two (2) project areas are referred to as Project Area 1 and Project Area 2 and are more generally described below:

- **Project Area No. 1** is in Highlands, Texas and is approximately fifty-seven (57) Acres (AC). It is generally bounded by Pin Oak Drive (including the properties on the north side of Pin Oak), Spring Bayou to the east, Park Street to the south and the San Jacinto River to the west.
- **Project Area No. 2** is in Lynchburg, Texas and is approximately 403 AC. It is generally bounded by I-10 East Freeway to the north, Spring Bayou to the east, Burnet Bay to the south and Crosby Lynchburg Road to the west.

1.2 Project Organization

This section identifies the individuals and organizations responsible for the planning and execution of field operations, laboratory services, and data validation and reporting. The project organization is depicted in **Figure 1**.

Figure 1 – Organizational Chart for Project Activities



1.3 Project Description

This QAPP/SAP specifies the procedural and analytical requirements needed to address the sample collection during the sampling event. Results of the analyses of samples will be used to evaluate potential impacts to the private drinking water wells within the target study area.

InControl Technologies will collect samples during the sampling event and submit these samples to Xenco Laboratories located in Houston, Texas for analysis. Due to the specialization of a number of the methods, Xenco will subcontract Summit Environmental to do these analyses. The samples will be analyzed for volatile organic compounds, semi-volatile organic compounds, pesticides, dioxins, metals, and other compounds.

2.0 Analytical Requirements

This section of the report defines the analytical requirements for the project.

2.1 Analytical Methods

The water well sampling protocol will include the required drinking water standard analysis as defined under the USEPA Standard Methods for drinking water as prescribed in Title 40 Code of Federal Regulations (CFR) 141. All proposed analysis will follow approved Environmental Protection Agency (EPA) Standard Methods for drinking water of which will be indicated on all data packages produced during the conduct of this sampling activity. InControl Technologies will use a National Environmental Laboratory Accreditation Program (NELAP) laboratory to analyze for the compounds defined below:

- EPA Method 524.2 for Regulated Volatile Organic Compounds
- For the Synthetic Organic Compounds
 - EPA Method 504.1 – EDB & DBCP
 - EPA Method 508 – PCBs, Toxaphene and Chlordane
 - EPA Method 515.1 – Chlorinated Acids
 - EPA Method 525.2 – Semi-volatile Organic Compounds
 - EPA Method 531.1 – Carbamate Pesticides
 - EPA Method 547 – Glyphosate
 - EPA Method 548.1 – Endothall
 - EPA Method 549.1 – Diquat
- For dioxins, metals and other compounds
 - EPA Method 200.8 – Primary Drinking Water Metals
 - EPA Method 200.7 Rev 4.4 – Secondary Drinking Water Metals
 - EPA Method 353.2 - Nitrate as N and Nitrite as N
 - EPA Method 335.4 – Total Cyanide
 - EPA Method 1613B – Dioxins (17 congeners)
 - EPA Method SM4500S2 – Hydrogen Sulfide
 - EPA Method 9223B – Coliforms

InControl Technologies will collect samples for each of these target compounds following the specific requirements for each of the methods. This includes the appropriate sample containers, preservatives and holding times. The standard analytical turnaround time will vary per method. The longest expected turnaround time is 30 days for the dioxins.

The laboratory used for data analysis has an established Quality Assurance and Quality Control (QA/QC) program and is certified to conduct the water quality method as described under 40 CFR 141. The sample collection and continuity (integrity of aliquot) will be maintained during the entire time through strict chain of custody. Laboratory QA/QC including field duplicate samples will be included based on 10% of the actual number of well samples.

2.2 Quality Control Analysis

Laboratory QC samples (e.g., blanks and laboratory control samples) will be included in the preparation batch with the field samples. An analytical batch is a number of samples (not to exceed 20 environmental samples plus the associated laboratory QC samples) that are similar in composition (matrix) and that are extracted or digested at the same time and with the same lot of reagents. Matrix Spikes (MSs) and Matrix Spike Duplicates (MSDs) count as environmental samples. The term analytical batch also extends to cover samples that do not need separate extraction or digestion (e.g., volatile analyses by purge and trap). The identity of each analytical batch will be unambiguously reported with the analyses so that a reviewer can identify the QC samples and the associated environmental samples.

2.3 Quality Control Limits

Quality control limits are specific for each method. Several of the methods will be analyzed by Summit Environmental (subcontracted through Xenco Laboratories). Their specific QC information is listed below.

Method Number	Control Limits
EPA 525	70-130%
EPA 515	70-130%
EPA 531	70-130%
EPA 547	70-130%
EPA 548	70-130%
EPA 549	80-120%
EPA 1613 B	73-146%

Compound Specific Control Limits Within EPA Method 515

Analyte	Units	Spike	Low	High
2,4,5-TP	µg/L	3	42	226
2,4-D	µg/L	12	48	214
Dalapon	µg/L	12	40	160
Dicamba	µg/L	6	38	232
Dinoseb	µg/L	12	5	100
Pentachlorophenol	µg/L	1.2	36	224
Picloram	µg/L	6	44	138

Included in **Attachment A** are the QC control limits for the methods that will be analyzed by Xenco Laboratories. Total Coliform does not have control limits since it is not spiked.

3.0 Quality Objectives and Criteria for Measurement Data

This section of the report defines the overall Project Quality Objectives and Criteria for data usability to meet the quality objectives for this project.

3.1 Accuracy

Accuracy is the degree of conformity of a measurement to a true value or a known standard and reflects the total error associated with a measurement. Accuracy in analysis is a function of the calibration method. Measurement accuracy is determined by analyzing a standard of known concentration and comparing the measured result to the true concentration. Continuing calibration verifications (CCV), laboratory control samples (LCS), matrix spike (MS) samples, and surrogate spike samples are examples of quality control (QC) procedures that are used to measure analytical accuracy. The analytical laboratory will provide accuracy acceptance criteria for the project analytical methods.

Accuracy will be expressed and calculated as the percent recovery of a known concentration of analyte added to a field sample. Recovery from spiked samples will be calculated as:

$$\%R = 100\% \times \frac{(S - U)}{C_{sa}}$$

where:

%R = percent recovery
S = measured concentration in spiked aliquot
U = measured concentration in unspiked aliquot, and
C_{sa} = actual concentration of spike added.

For situations where a standard reference material (SRM) is used instead of or in addition to matrix spikes, recovery will be calculated as:

$$\%R = 100\% \times \frac{C_m}{C_{srM}}$$

where:

%R = percent recovery
C_m = measured concentration of SRM
C_{srM} = actual concentration of SRM

To the extent practical, spiked samples and LCSs should include all target compounds or analytes for the given analysis. The analytical laboratory will provide acceptance criteria for spikes, LCSs, and surrogate recoveries.

Only project samples will be used for matrix spikes/matrix spike duplicates (MS/MSD). Blanks will not be used for the preparation of MS/MSDs. For each shipment of samples sent to the selected laboratory, sufficient sample volume will be collected and provided with the shipped samples to be

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used for preparation of the MS/MSD. This sample will include sufficient volume such that one re-extraction/re-analysis of the organic MS/MSD pair or one re-digestion/re-analysis of the inorganic spike may be performed. Alternatively, a sample delivery group system may be established, and sufficient volume for an MS/MSD need only be collected once per sample delivery group.

3.2 Precision

Precision measures the reproducibility of measurements. It is defined as the degree of mutual agreement among independent measurements as the result of repeated application of the same process under similar conditions. Analytical precision is the measurement of the variability associated with duplicate or replicate analyses. Total precision is the measurement of the variability associated with the entire sampling and analysis process. Total precision is determined by analysis of duplicate or replicate field samples and measures variability introduced by both the laboratory and field operations. Field duplicate samples and MSD samples are analyzed to assess precision. The analytical laboratory will provide precision acceptance criteria for the project-specific analytical methods.

The principal measurement of precision for the project will be relative percent difference (RPD) obtained from duplicate sample pairs and will be calculated as:

$$RPD = \frac{(C_1 - C_2) \times 100\%}{(C_1 + C_2)/2}$$

where:

C1 = larger of two observed values
C2 = smaller of two observed values.

Field duplicate samples will be collected at a frequency of no less than 10 percent of the number of field samples collected and of each matrix sampled. To the extent practical, field duplicates will be coded and labeled such that data validation staff can readily identify duplicates but the laboratory cannot.

Laboratory duplicates (including MS/MSD) will be prepared and analyzed for each matrix submitted to the laboratory, as prescribed in the approved method, and at a frequency of no less than five percent of the number of project samples analyzed. Laboratory duplicates will be analyzed concurrently with the associated project samples.

3.3 Completeness

Completeness will be calculated and reported for each method, matrix, and analyte. A completeness goal of 95 percent will be achieved for both field and laboratory activities. Failure to meet completeness goals is an indicator that data gaps exist and the data set is insufficient to support project objectives. The project personnel will require prompt notification by the selected laboratory in the event of sample loss, or if samples are received at the laboratory in a compromised form as a result of shipping damage.

Completeness is generally calculated for each type of measurement/analysis as follows:

$$\%C = 100\% \frac{V}{n}$$

where:

%C = percent completeness

V = number of measurements judged valid

n = total number of measurements necessary to achieve a specified level of confidence in decision making.

In addition to completeness goals, critical samples should be identified and appropriate controls maintained to ensure that collected data are of the requisite type, quantity, and quality.

3.4 Representativeness

Representativeness is the degree to which each sample is a valid and true representative of field conditions. It is achieved through use of proper sample collection, compositing, handling, preservation, packaging, transport, and storage practices. Representativeness is also ensured through elements such as proper well locations, drilling and installation procedures, sampling locations, and statistical sampling design. In the laboratory, appropriate subsampling or aliquoting techniques will ensure representativeness. Representativeness will be assessed through results of duplicate field and laboratory samples.

3.5 Comparability

Comparability is the confidence with which one data set can be compared to another data set. The types of matrices sampled and the range of field conditions encountered are considered in determining comparability. Comparability will be achieved by using standardized and consistent methodology, performance conditions, practices, reporting units, and reporting formats.

3.6 Sensitivity

Sensitivity will be expressed in terms of detection and quantitation limits for each type of measurement/analysis. Detection /quantitation requirements for each analyte and matrix will be determined during the Data Quality Objective (DQO) planning process and specified in the site Quality Assurance (QA) Project Plan in tabular format. Detection/quantitation limits should be compared to the levels proposed within the applicable methods to verify that they are attainable with the specified methodology and instrumentation. The reporting limits will be provided by the analytical laboratory for each analytical method.

Method Detection Limit (MDL) is defined as follows:

$$MDL = t_{(n-1, 1-\alpha=0.99)} \times S$$

where:

MDL = method detection limit

$t_{(n-1, 1-\alpha=0.99)}$ = students' t-value for a one-sided 99% confidence level and a standard deviation estimate with n-1 degrees of freedom
S = standard deviation of the replicate analyses.

Where required, method detection studies will be performed in accordance with 40 CFR 136. Normally, seven replicates will be employed for determining MDLs. The laboratory will notify InControl, prior to project sample analysis, if the laboratory anticipates or experiences any difficulties in achieving the detection/quantitation limits specified by the project leader.

Matrix effects should be considered in assessing the selected laboratory's compliance with sensitivity specifications. The laboratory will provide a detailed discussion of all failures to meet sensitivity specifications in the data package narrative. If a sample dilution results in non-detected values for analytes that had been detected in the original analysis, the results of the original run and the dilution will be reported with the appropriate notations in the data narrative.

4.0 Special Training and Certification

Personnel will be trained and certified as required to complete the technical aspects of this QAPP/SAP. As appropriate to their responsibilities, project personnel will be proficient in relevant aspects of sample collection, shipping, handling, and analysis; data reporting and management; and the related QC requirements and practices. Each member of the technical staff must demonstrate proficiency with their assigned duties to include the preparation of associated documentation.

Where required, the project personnel will be certified and current in the Occupational Safety and Health Administration (OSHA) Hazardous Material Site Worker Training (40-hour initial training and 8-hour annual refreshers).

5.0 Sampling Methods

This section of the SAP/QAPP describes the sampling methods that will be employed during the conduct of the private water well sampling program.

5.1 Groundwater Sampling

All ground water sample collection activities will be performed by InControl Technologies field personnel. Sample containers will be obtained by InControl directly from the laboratory and will be pre-preserved as necessary. **Table 1** lists the pertinent container details.

Table 1: Container Specifications by Method

Name	Analytical Method	Container	Preservation	Minimum Sample Volume	Maximum Holding Time
VOCs	EPA 524	3-40 mL clear VOAs	Na ₂ S ₂ O ₃ to pH < 2	40 mL	14 days
DBCP & EDB	EPA 504	2-40 mL clear VOAs	Na ₂ S ₂ O ₃	40 mL	14 days
PCBs, Chlordane, Toxaphene	EPA 508	1-1 L Amber	Na ₂ S ₂ O ₃	1 L	14 days
Chlorinated Acids	EPA 515	1-1 L Amber	Na ₂ SO ₃	1 L	14 days
SVOCs	EPA 525	1-1 L Amber	Na ₂ SO ₃ to pH < 2	1 L	14 days
Carbamate Pesticides	EPA 531	2-40 mL amber VOAs	C ₆ H ₇ KO ₇ and Na ₂ S ₂ O ₃	40 mL	28 days
Glyphosate	EPA 547	2-40 mL amber VOAs	Na ₂ S ₂ O ₃	40 mL	14 days
Endothall	EPA 548	1-250 mL amber glass	Na ₂ S ₂ O ₃ to pH < 2	250 mL	7 days
Diquat	EPA 549	1-250 mL dark plastic	Na ₂ S ₂ O ₃ to pH < 2	250 mL	7 days
Dioxins	EPA 1613 B	1-1 L Amber	Na ₂ S ₂ O ₃	1 L	1 year
Metals	EPA 200.7, EPA 200.8, EPA 245.1	1-500 mL plastic	HNO ₃	500 mL	180 days 24 days (Hg)
Nitrite and Nitrate (as N)	EPA 353.2	1-250 mL plastic	Neat	250 mL	48 Hr
Total Nitrogen	Calc (EPA 351.2 + EPA 353.2)	1-250 mL plastic	H ₂ SO ₄	250 mL	28 days
Cyanide	EPA 335.4	1-250 mL plastic	NaOH and Ascorbic Acid	250 mL	14 days
Hydrogen Sulfide	SM4500S2	2-250 mL plastic	Btl 1: NaOH and Zn(O ₂ CCH ₃) ₂ Btl 2: Neat	250 mL	7 days
Total Coliform	SM9223B	1-120 mL plastic	Na ₂ S ₂ O ₃	250 mL	24 Hr

Notes: Na₂S₂O₃ = Sodium Thiosulfate

Na₂SO₃ = Sodium Sulfite

C₆H₇KO₇ = Potassium Dihydrogen Citrate

NaOH = Sodium Hydroxide

Zn(O₂CCH₃)₂ = Zinc Acetate

H₂SO₄ = Sulfuric Acid

For **Method 524**, add two drops of 1:1 hydrochloric acid (HCl) in each 40mL vial **following sample collection**. Seal the sample bottles and **mix for 1 minute**. If the sample foams vigorously when HCl is added, do not add HCl to the remaining vials and label them as "NOT ACIDIFIED". These samples must be analyzed within 24 hours of collection time if they are to be analyzed for any compounds other than trihalomethanes (THMs).

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For **Method 525**, add a sufficient amount of drops of 1:1 hydrochloric acid to the bottle **following sample collection** to adjust the pH < 2. Check with pH paper to ensure the pH is below 2 after the addition.

For **Method 548**, add a sufficient amount of drops of 1:1 hydrochloric acid to the bottle **following sample collection** to adjust the pH < 2. Check with pH paper to ensure the pH is below 2 after the addition.

For **Method 549** add a sufficient amount of drops (approx. 20 drops) of Sulfuric Acid to bring the pH to <2 **following sample collection**. Check with pH paper to ensure the pH is below 2 after the addition.

The locations sampled, observations, number and type of containers, and requested analyses will be recorded in the field notebook, chain-of-custody form, and field sampling report. These QA/QC records will be managed and retained. Immediately following collection samples will be placed on ice in a cooler for shipment to the laboratory and will be handled under formal chain of custody from the time the samples are collected through their final disposition.

Samples collected by InControl during this sampling event will be submitted to Xenco Laboratories for analysis.

5.2 Field QC Samples

QC samples will be collected to ensure sample results are representative of actual field conditions. For liquid environmental samples (non-waste samples) designated to be analyzed for VOC content, one trip blank will be included in each cooler batch shipment to the lab. For each matrix sampled, one duplicate field sample will be collected for every 10 samples. One extra volume for Matrix Spike/Matrix Spike Duplicate (MS/MSD) will be collected for every 20 field samples.

5.3 Instrument/Equipment Testing, Inspection, and Maintenance

Field equipment will be appropriate and approved for its intended use. The handling of the water quality meters and sampling device will be controlled to ensure initial and continued conformance with applicable technical requirements and acceptance criteria.

5.3.1 Inspection and Testing

It is recommended that measurement and testing equipment (water quality meter) be calibrated and maintained according to the manufacturer's recommendations. Field equipment will be visually inspected before shipment to the field and again before use. Sample collection and storage equipment will be cleaned, stored, and handled using the necessary precautions against cross-contamination, corrosion, and damage. The calibration procedure is included in **Attachment B**.

Equipment, parts, or components that do not meet specifications (i.e., nonconforming items) will be identified in a manner that is easily recognized. These items will be controlled so as to prevent their inadvertent use or installation.

5.3.2 Preventative and Remedial Maintenance

Field and laboratory equipment will be maintained on routine preventive maintenance schedules. Preventive and remedial maintenance will be performed and verified by qualified personnel and in accordance with approved procedures and manufacturer's recommendations. The equipment regularly goes into a service center to be maintained including replacing or repairing probes, changing out calibration and internal solutions. Maintenance records will be generated, retained, and reviewed as part of the project quality records.

Maintenance activities will be documented in instrument specific logbooks. Entries should include the following information:

- Equipment identification (e.g., type, model, serial number, and manufacturer)
- Procedure reference description, and results of calibration/maintenance
- Name and affiliation of the person who performed maintenance
- Date, description, and results of calibration/maintenance
- Name and affiliation of the person who performed maintenance.

5.3.3 Instrument/Equipment Calibration and Frequency

Each water quality meter will be calibrated twice per day. The first calibration will take place upon arrival at the site in the morning. The second calibration will take place in the afternoon following lunch. Each field technician will be responsible for calibrating his/her instrument. All calibration records will be maintained and submitted to the project manager with the field remainder of the field notes. All calibration techniques will be follow the suggested manufacture's recommendation.

5.3.4 Inspection/Acceptance of Supplies and Consumables

Materials used in the execution of work will be appropriate and approved for intended uses. The procurement and handling of quality-affecting materials will be controlled to ensure initial and continued conformance with applicable technical requirements and acceptance criteria. These items will be visually inspected before shipment to the field and again before use. Inspection elements will include, as appropriate, a review of physical condition, expiration dates, limitations of use, size and quantity, and quality grade (e.g., reagents and solvents). Quality-affecting materials that are to be controlled include, but are not limited to, sample bottles, deionized water, disposable sampling supplies, and disposable personal protective equipment (PPE). Materials that do not meet performance specifications will be segregated and labeled to preclude use.

5.3.5 Decontamination

Before attaching the purging apparatus to the faucet, a butane torch will be briefly passed over the faucet to sterilize it. The water supply well purging apparatus will be decontaminated before use at each well. The apparatus will be washed using Alconox soap and rinsed with distilled water. In addition, prior to attaching the apparatus to each water well, it will be thoroughly rinsed in the well water from each well. Dedicated tubing will be used at each well location. The water well sample will be collected prior to the

connection to the water quality instrumentation to minimize the potential for cross contamination. The sample is never collected from the flow cell in which the water quality instrument is housed. The water quality meters will be decontaminated using Alconox soap and distilled water at the end of each day.

6.0 Sample Handling and Custody

This section of the SAP/QAPP discusses sampling handling and chain of custody procedures to be employed during this project.

6.1 Sample Identification

The InControl field staff will assign and issue a unique sample identification number for each sample collected under his/her purview. Once assigned, the sample number will be included on the sample label and referenced on the chain-of-custody form, the field logbook, and all data reports related to the sample. The sample numbers will comply with following Sample Id Protocol:

E16010-XX where "XX" is a sequential sample number.

A label will be affixed on each sample bottle before sample collection. Information on the sampling labels will include the sample identification number, sampler's name or initials, chemical/physical preservative used, analysis requested, date/time collected, and type of sample. The sample number will correlate to a specific property/water well address. Each target address will have a unique sample id.

6.2 Sample Delivery

The samples will remain in the custody of InControl personnel until they are relinquished to the laboratory. The samples will be delivered to the laboratory within 48 hours of collection. The turnaround of analytical results from receipt of samples at the laboratory to submittal of results will be based on a standard turnaround time.

6.3 Sample Custody

The InControl field staff will ensure the integrity and security of all samples under their control using a stringent sample custody protocol comparable to the chain-of-custody protocol. Chain-of-custody, which begins with sample collection and terminates upon sample disposal, will be documented throughout the life-cycle of each sample. A chain-of-custody form will be initiated during sample collection and will remain with the samples until receipt by the laboratory. The chain-of-custody record will include the sample numbers, date and time of collection, sampling location, name of the person who collected the samples, preservatives used, and the analyses requested. Each sample transfer will then be documented on the chain-of-custody form. Copies of completed air bills, if necessary, will be included as part of the final custody documentation.

If samples are shipped via a commercial carrier, at the time that samples are relinquished to the carrier, the person responsible for shipping the samples will perform the following activities:

- Remove all labels from the outside of the cooler
- Sign the chain-of-custody form under "Relinquished By," enter the name of the carrier organization under "Received By," and document the date and time of transfer
- Enclose the sheet in a waterproof plastic bag and tape it to the inside top of the sample cooler
- Secure the cooler with strapping tape and custody seals in such a manner that the cooler cannot be opened without disturbing the seals

- Photograph the sealed cooler (if camera is available) and record all the requisite information in the field logbook.

At the time that custody is transferred from the carrier to the analytical laboratory, the laboratory's sample custodian will perform the following activities:

- Indicate the carrier organization on the chain-of-custody form under "Relinquished By"
- Sign off under "Received By" and document the date and time of transfer.

Under no circumstance should there be a break in custody.

Upon receipt of samples by the analytical laboratory, the sample custodian will sign and date the "received by" portion of the chain-of-custody form. The sample custodian will also check the temperature of each ice chest and record this information on the chain-of-custody form and internal traffic log. The pH of those samples intended for inorganic analyses will be checked and recorded after scanning for radioactivity. If an ice chest is found to be warmer than 6°C, InControl will be notified. In the laboratory, the necessary documentation will be prepared and distributed to all involved analysts, and the samples will be stored in appropriate refrigerators. Access to the samples will be obtained through the sample custodian.

The analytical laboratory's sample management and analytical documentation procedures will satisfy InControl requirements. All samples will be handled under strict chain-of-custody protocol, and in the laboratory, samples and extracts will be tracked and accounted for at all points during processing. The original sample analysis data will be captured in a permanent form, along with the appropriate documentation to support its quality. A sufficient level of redundancy will exist so that all information can be verified from multiple sources

6.4 Sample Containers and Coolers

Sample containers and coolers will be inspected before each use. All sample containers will be provided by the laboratory. In addition, the laboratory will provide pre-printed labels for each group of samples. The sample kits will be delivered by the laboratory to InControl's office prior to the beginning of the sampling event. Extra containers will be readily available to project personnel as a contingency for damaged or potentially contaminated containers and for use with samples of opportunity. Sample containers will be kept away from fuels and solvents.

6.5 Sample Storage

Immediately following collection, all samples will be placed in a cooler on ice and chilled to 4 degrees Celsius or below. Chain of custody forms will remain with the coolers at all times. Upon completion of the sampling event, the samples will either be delivered directly to the laboratory by InControl personnel or the laboratory will send a driver to come pick the samples up from InControl. An unbroken chain of custody will be maintained throughout the process.

7.0 Water Well Information and Database

Prior to mobilizing to the subject site, InControl Technologies will compile a list of private water wells and develop a water well database for each private residence well to be tested. HCPCS will provide the initial list of private residence wells to be tested to InControl Technologies subsequent to written notification regarding this project to the residents who live in the two (2) project areas. The initial notification will include a project participation and access form which will grant property access for well sampling by InControl Technologies.

InControl Technologies will cross reference the information provided from HCPCS with the water well information. This “ground truthing” will be used to develop site sampling packages for each of the target water wells. The site sampling packages will include the site address, site contact and phone number, well log and general site map. Well sampling field sheets will be provided along with sample labels for each of the sample jars. This information will be used to confirm well construction details, water well location and general configuration of the water well and storage tank.

8.0 Documents and Records

Upon sampling the water wells, InControl Technologies will document/confirm well construction details and additional well information, where available, for each well, as noted below:

- Owner addresses and contact information (legal name, street address, city, state and zip code);
- Verification of well location via Geographic Information System (GIS) coordinates using a sub meter GPS;
- Drill Date;
- Well depth;
- Previous sampling dates for each well;
- Drill logs;
- Disinfection type and frequency;
- Raw water tap location;
- Schematics/photo record; and
- Condition of well casing

Field notebooks will be used to record information obtained during the sampling activities. Documentation of sampling activities will be recorded in the field. The following types of information will be recorded in the field notebook:

- Location of activity
- Date and time
- Personnel performing the activity
- Weather conditions (e.g., temperature, precipitation, wind direction, relative humidity)
- Sample type and sample collection method
- Unique sample number
- Description of the sample (e.g., color, odor, clarity)
- Identification of conditions that might affect the representativeness of the sample.

Project personnel will take photographs to document field activities and the condition and surroundings of each water well.

It is expected that Harris County will obtain and provide the release forms and landowner permission that will allow the selected vendor entry to the property to fulfill the requirements of this project. Additional questions that may arise from residents or others in the community during our sampling efforts will be directed to either Harris County Attorney's Office (CAO) or HCPCS.

The water well samples will be collected following the Water Well Sampling Standard Operating Procedure included in **Section 11**. The water well samples analysis will be analyzed using the EPA approved drinking water analytical methods prescribed in 40 CFR 141 with corresponding quality assurance/data validation.

Chain of custody, which begins with sample collection and terminates upon sample disposal, will be documented throughout the life cycle of each sample using a chain-of-custody form. A chain-of-Custody form will be initiated during sample collection and will remain with the samples until receipt in

the laboratory. The chain-of-custody record will include the sample numbers, date and time of collection, sampling location, name of the person who collected the samples, preservatives used, and the analyses requested. Each sample transfer will then be documented on the chain-of-custody form.

The analytical laboratory will provide an analytical report to InControl Technologies. The report will be signed by the laboratory director and include a narrative about the analyses, original completed chain-of-custody forms, and any other documentation received with the samples. The analytical laboratory will also include a summary of the calibration data and laboratory QC data, and raw data (e.g., instrument printouts and manual records). At a minimum, the report will include the following elements:

- Dates of sample receipt, preparation, and analysis
- Condition of samples upon receipt
- Sample preparation and analysis procedures
- Problems encountered during sample handling, storage, preparation, or analysis, and subsequent corrective and preventive actions
- Deviations for approved standard operating procedures (SOPs)
- Discussion of resulting data quality.

The InControl project manager and the analytical laboratory will maintain requirements for case file maintenance and archiving. The case file will contain the following:

- Internal laboratory chain of custody
- Copy of field sample collection crew's chain-of-custody
- Logbook records (sample preparation, standard preparation, run sequence logs)
- Copies of final internal (laboratory) raw summary sheets from which data are entered
- Information needed to evaluate results (acceptance limits, control charts, detection limits, retention time windows, tunes, percent moisture, corrective actions)
- Instrument printouts, including chromatograms (gas chromatography (GC), gas chromatography /mass spectrometry (GC/MS), liquid chromatography (LC), ion chromatography (IC) spectra of raw responses)
- Internal (laboratory) detail documentation supporting internal QA and assessment, precision, and accuracy (replicates, duplicates, matrix spikes, matrix spike duplicates, trip blanks, control samples, calibration checks).

In summary, documentation must be sufficient to recheck and recalculate reported results at a later date if it becomes necessary. Both electronic and hardcopy data reports will be archived. In all cases, hardcopy printouts will supplement these electronic reports.

9.0 Final Project Report

InControl Technologies will prepare a final report that includes at a minimum:

- Project description including a brief summary of:
 - The site setting,
 - Project objective,
 - Project Background
- Detailed discussion of the sampling and analysis and data quality objectives;
- Well Location and Construction Detail from the water well database established by InControl Technologies;
- Summary of analytical results of the water well sample analysis including
 - Comparisons to corresponding Maximum Contaminant levels (MCLs) and background/control sample date, if applicable;
 - Discussion of Groundwater Quality Parameters
 - Field sampling forms
- An appendix of all laboratory documentation including chain of custody forms;
- Raw data (which will indicate methodology used); and
- Final quality assured data.

The Toxicity Equivalency Factors will be based on the values listed in Figure 30 TAC §350.76(d)(2)(B) or the latest set of factors in use by the USEPA as currently published in USEPA's guidance document *Recommended Toxicity Equivalency Factors for Human Health Risk Assessments of Dioxin and Dioxin-Like Compounds* (December 2010, 100-R-10-005). The data tables will report the analytical results for the dioxin congeners. More specifically, congeners with positive results which are identified in the blank will be reported as "U" if the value is less than 5 times the observed value in the method blank. The tables will include both the unadjusted and adjusted reporting values for each of the congeners. A Dioxin Equivalence Quotient will be calculated to determine whether the reported concentrations exceed the established MCLs. For PCBs, the sum of all the PCB mixtures will be used to establish a total PCB concentration. The total PCB concentration will be compared to the MCL. For all other compounds, the concentration will be directly compared to the MCL.

10.0 Data Usability Summary

Water well data generated as part of this project will be used to demonstrate compliance with USEPA Superfund Data Quality Objectives. Therefore, the data must be of known and documented quality. InControl Technologies will ensure the data is of sufficient quality to meet the objectives of the SAP. The Data Usability Summary will be prepared. This document provides guidance for reporting and reviewing project chemical concentration data to be used to demonstrate that the data is of sufficient quality for its intended use.

The suitability of environmental data for their intended use(s) will be determined. Data usability involves an evaluation of the quantity, type, and overall quality of generated data against the project objectives. The usability of data that are associated with QC results outside established acceptance criteria is generally dependent on the degree of the exceedance, whether the potential bias is high or low, and whether the uncertainty implied by the exceedance is significant. Usability will be assessed in accordance with the applicable EPA guidance

11.0 Sampling and Analysis Procedure

The following is a summary of the specific tasks that will be completed during the water well sampling activities:

11.1 Field Work Preparation

Prior to sampling, an inventory of all field supplies will be conducted and any supplies not currently in stock will be ordered. Arrangements will be made with the selected laboratory prior to sample collection. A sample kit will be ordered prior to the sampling event. The order in which the wells will be sampled should be established prior to the sampling event. Sampling order will likely be determined based on logistics or the known or suspected water quality of the wells. Each water well owner, operator, or property resident will be contacted to let them know on what date their well will be sampled and to discuss any site access issues. Field sampling sheets will be prepared for each well that needs to be sampled. Previous sampling information may be helpful to bring along.

All field equipment will be properly calibrated prior to beginning the sampling process. Non-dedicated field equipment such as the sampling apparatus, must be properly cleaned, disinfected, or decontaminated prior to and after use in each well. All field equipment that comes in contact with a water supply well must be properly disinfected to prevent the introduction of bacterial contamination (e.g. coliform or iron bacteria) into the water supply. All non-dedicated equipment should be disinfected just prior to and after use in each well. Nitrile gloves will be worn when cleaning all sample equipment. When not in use, sampling equipment will be placed on a clean surface.

11.2 Purging and Sampling Procedures

The following is a detailed discussion of the field sampling protocol. An abbreviated field form is included in **Attachment C**.

1. All field personnel will meet in a central starting location on the first day.
2. Gather all appropriate field equipment.
 - Laboratory Sample Kit with Chain of Custody
 - Pre-printed Labels
 - Well Purging Apparatus
 - Water Quality Meter
 - Tubing
 - Field Sampling Forms
 - Field Book
 - Sampling Analysis Plan
 - GPS Unit
 - Butane Lighter
 - Camera
3. Calibrate sampling equipment at beginning of day and in afternoon.

4. Obtain list of wells each person will be sampling and in what order they will be sampled.
5. Leave central starting location.
6. Locate well to be sampled and notify resident that sampler is on site.
7. Review all supplied well construction information for well.
8. Collect GPS readings for well.
9. Take picture of the well and any pressure or storage tanks and/or treatment systems.
10. Locate sample port closest to well's pump/wellhead as possible. It is preferable to collect samples from a cold water faucet/tap, before the water passes through any storage tanks, pressure tanks or physical or chemical treatment systems that may alter the quality of the groundwater sample. Document on the field data sheet the location of the sample point.
11. If there is no sample point close to the wellhead, choose a location least affected in the well's distribution system. Document on the field data sheet the location of the sample point, the type of system the water passes through and what effect it may have on the quality of the sample.
12. Faucets or taps used to collect water samples should be in good condition. Inspect the faucet for any signs of corrosion, dirt or leakage that might compromise field parameter measurements or sample quality. If the faucet needs to be altered or cleaned in any way prior to sample collection, obtain permission from the property owner first. If the faucet is dirty or corroded, use a stiff bristle or wire brush to clean the threads on the faucet. Rinse with deionized water. If collecting bacteriological samples such as fecal coliform, sanitize the inside and outside of the faucet with a butane lighter or propane torch until dry. Do not touch the faucet with your bare hands after sanitizing.
13. Remove any hoses, aerators, filters, or other devices from the faucet.
14. Connect the Y-split flow controller/Y-fitting designed by InControl (**Figure 1**) to the selected faucet. Connect tubing or a hose to one arm of the Y-fitting. This will be the main purge water discharge. The flow rate for the purge water discharge hose can be at the pump's capacity (e.g. 5 gallons/minute) so that the well can be purged in a reasonable time frame.

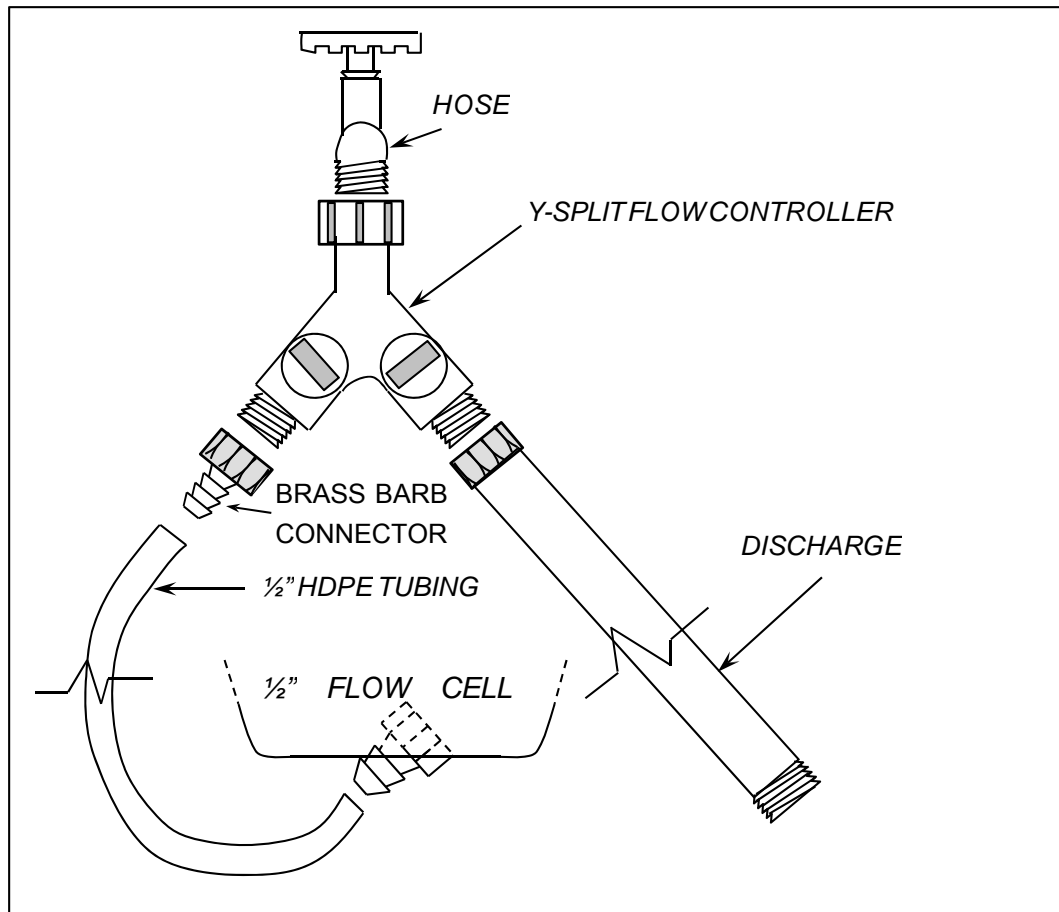


Figure 1 – Schematic for Typical Water Supply Well Purging Apparatus

15. Connect tubing to the other arm of the Y-fitting and attach it to the flow cell for field parameter measurements. Flow rate for this side of the Y-fitting should be low (e.g. 1-2 L/minute) to accommodate flow specifications of the field meters and flow cell.
16. Start purging by opening the faucet and valves on the attached Y-split flow controller. Use the valves on the Y-fitting to regulate the flow rates to both the flow cell and the discharge hose. Use a 5-gallon bucket and a stopwatch to measure the pumping rate from the discharge hose. Record the rate on the field data sheet.
17. Purge water for most projects may be discharged directly to the ground. Direct the purge water away from the well head and work area. If the purge water is contaminated it should be containerized and disposed of properly.
18. The amount of water to be purged depends on two primary factors: 1) whether there's a storage/pressure tank located between the pump and sample point and 2) whether the well is used regularly or infrequently.
19. If the sample faucet is located before any storage or pressure tanks, the purge time should be relatively short. Purge until enough water has flushed any standing water from the plumbing and

field parameters have stabilized (5 minutes). If the sample faucet is located after a tank, then the storage capacity of the tank needs to be accounted for while purging. Purge until enough water has flushed any standing water from the plumbing, including the tank, and field parameters have stabilized (10 minutes). Water supply wells that are in regular service, where the pump runs routinely, should purge rather quickly. Wells that are used infrequently should be given enough time to purge so that the plumbing is thoroughly flushed and field parameters have stabilized (15 minutes).

20. During purging and sample collection the flow should be a smooth, solid stream of water with no air or gas bubbles in the tubing or flow cell. Gradually adjust the pumping rate to eliminate bubbles if present. Once the flow is constant, begin monitoring field parameter values in a flow cell at regular intervals (e.g. 3 minutes). Record the field parameter values, time of measurement, and the amount of purge water discharged. Note and provide qualifying remarks if parameter readings are anomalous or unstable due to instrument problems. Record observations on the pumped water's appearance (e.g. clarity, odor, etc.) during purging and sampling. Monitored field parameters include pH, specific conductance, dissolved oxygen, water temperature, and oxidation reduction potential.
21. When sampling for metals, turbidity should be measured and have either stabilized or be below 10 NTUs. Once field parameters stabilize collect samples as specified in the project QAPP. Purge and sample withdrawal should form a continuous process. Slowly reduce, but do not stop, the faucet flow rate. Use the Y-fitting valve to turn off the flow to the discharge hose. Maintain the flow through the flow cell side of the Y-fitting. Disconnect the hose from the flow cell and begin collecting the sample. Do not touch the tubing to the bottle while filling.
22. Samples should be collected in a specific order as determined in the project QAPP. The order of sample collection, processing and preservation for specific analytes should be adhered to consistently throughout the project. The recommended sequence for sample collection and processing is often based on logistics for maintaining sample integrity. Sample collection order is usually based on the analytes' sensitivity to change. Those analytes most sensitive to change (e.g. organics) are usually collected first, while analytes less sensitive to change (e.g. nutrients) may be collected last. The sequence can be modified, depending on the types of samples to be collected and on data objectives. The relative importance of each analyte should be evaluated by project. Samples for analytes of most interest may be collected first to ensure that a representative sample is obtained.
23. Field duplicate samples will be collected according to the frequency specified in the QAPP. These samples are collected by alternating the sample stream between two of the same type sample container.
24. Label sample containers and immediately place in a cooler on ice. Record sample date and time on the field data sheet. A proper chain of custody will be kept for each sample set.

11.4 Records Management

All water wells that are sampled will be entered into a database created by InControl Technologies. The database will include sampling dates and well construction information. In addition, one field sampling sheet will be prepared for each well and will be filled out during the sampling process. Following each sampling event, all the relevant field data will be entered into a spreadsheet. All hardcopy documentation, such as well reports and field data sheets, are kept and maintained by the project lead.

11.5 Safety

Worker Health and Safety is the highest priority at InControl Technologies. Proper safety precautions must be observed when collecting water well samples. Consider safety situations when accessing a water well. If entering a pump house, watch for objects stored in the pump house, including hazardous chemicals. Be aware of any possible animal hazards such as dogs, mice, snakes, wasps, and spiders.

Attachment A

Laboratory QC Control Limits for Xenco



Laboratory and Method DLs

E200.7 Water

Analyte	MDL	RL	Rep Units	LCL	UCL	RPD
Aluminum	0.0111	0.200	mg/L	70	130	20
Antimony	0.00589	0.0200	mg/L	70	130	20
Arsenic	0.00550	0.0100	mg/L	70	130	20
Barium	0.00135	0.0100	mg/L	70	130	20
Beryllium	0.000490	0.00400	mg/L	70	130	20
Bismuth	5.62	20.0	mg/L	70	130	20
Boron	0.00343	0.0500	mg/L	70	130	20
Cadmium	0.00243	0.00500	mg/L	70	130	20
Calcium	0.0293	0.200	mg/L	70	130	20
Chromium	0.000811	0.0100	mg/L	70	130	20
Cobalt	0.000673	0.0100	mg/L	70	130	20
Copper	0.00544	0.0200	mg/L	70	130	20
Indium	0.00330	0.0100	mg/L	70	130	20
Iron	0.0283	0.200	mg/L	70	130	20
Lead	0.00237	0.0100	mg/L	70	130	20
Lithium	0.00448	0.0200	mg/L	70	130	20
Magnesium	0.0500	0.400	mg/L	70	130	20
Manganese	0.00316	0.0200	mg/L	70	130	20
Molybdenum	0.00123	0.0100	mg/L	70	130	20
Nickel	0.00307	0.0100	mg/L	70	130	20
Potassium	0.107	0.500	mg/L	70	130	20
Selenium	0.00439	0.0300	mg/L	70	130	20
Silica (Calculation)	0.0781	1.07	mg/L	70	130	20
Silver	0.00559	0.0200	mg/L	70	130	20
Sodium	0.0667	0.500	mg/L	70	130	20
Strontium	0.00617	0.150	mg/L	70	130	20
Sulfur	0.00998	0.100	mg/L	70	130	20
Thallium	0.00621	0.0200	mg/L	70	130	20
Tin	0.00209	0.0200	mg/L	70	130	20
Titanium	0.00156	0.180	mg/L	70	130	20
Vanadium	0.00518	0.0900	mg/L	70	130	20
Zinc	0.00391	0.0300	mg/L	70	130	20
Zirconium	0.00330	0.0100	mg/L	70	130	20

E200.8 Water

Analyte	MDL	RL	Rep Units	LCL	UCL	RPD
Aluminum	0.00191	0.0200	mg/L	70	130	20
Antimony	0.000380	0.00200	mg/L	70	130	20
Arsenic	0.000396	0.00200	mg/L	70	130	20
Barium	0.000472	0.00400	mg/L	70	130	20
Beryllium	0.000166	0.00200	mg/L	70	130	20
Boron	0.00175	0.0100	mg/L	70	130	20
Cadmium	0.000115	0.00200	mg/L	70	130	20
Calcium	0.0102	0.100	mg/L	70	130	20
Chromium	0.000283	0.00400	mg/L	70	130	20
Cobalt	0.000146	0.00200	mg/L	70	130	20
Copper	0.000747	0.00400	mg/L	70	130	20
Iron	0.00170	0.0200	mg/L	70	130	20



Laboratory and Method DLs

E200.8 Water

Analyte	MDL	RL	Rep Units	LCL	UCL	RPD
Lead	0.000152	0.00200	mg/L	70	130	20
Magnesium	0.0101	0.100	mg/L	70	130	20
Manganese	0.000208	0.00200	mg/L	70	130	20
Mercury	0.0000153	0.000200	mg/L	70	130	20
Molybdenum	0.000318	0.00200	mg/L	70	130	20
Nickel	0.000139	0.00200	mg/L	70	130	20
Potassium	0.0139	0.100	mg/L	70	130	20
Selenium	0.000368	0.00200	mg/L	70	130	20
Silver	0.000159	0.00200	mg/L	70	130	20
Sodium	0.0188	0.100	mg/L	70	130	20
Strontium	0.000714	0.0100	mg/L	70	130	20
Thallium	0.000187	0.00200	mg/L	70	130	20
Tin	0.000202	0.00200	mg/L	70	130	20
Titanium	0.00156	0.00400	mg/L	70	130	20
Vanadium	0.000341	0.00200	mg/L	70	130	20
Zinc	0.000388	0.0300	mg/L	70	130	20

E245.1 Water

Analyte	MDL	RL	Rep Units	LCL	UCL	RPD
Mercury	0.0000263	0.000200	mg/L	70	130	20

E335.4 Water

Analyte	MDL	RL	Rep Units	LCL	UCL	RPD
Cyanide, Total	0.00198	0.00500	mg/L	85	115	20

E351.2 Water

Analyte	MDL	RL	Rep Units	LCL	UCL	RPD
Nitrogen, Total Kjeldahl	0.0501	0.300	mg/L	90	110	20

E353.2 Water

Analyte	MDL	RL	Rep Units	LCL	UCL	RPD
Nitrogen, Nitrate-Nitrite	0.0218	0.100	mg/L	80	120	20

E504 Water

Analyte	MDL	RL	Rep Units	LCL	UCL	RPD
1,2-Dibromo-3-Chloropropane	0.0200	0.0200	ug/L	70	125	25
1,2-Dibromoethane	0.0200	0.0200	ug/L	70	125	25

E508 Water

Analyte	MDL	RL	Rep Units	LCL	UCL	RPD
Alachlor	0.0560	0.100	ug/L	47	125	20
Aldrin	0.0420	0.100	ug/L	47	125	20
Chlordane	0.103	0.500	ug/L			
Dieldrin	0.0460	0.100	ug/L	42	132	20
Endrin	0.0630	0.100	ug/L	43	134	20
Gamma-BHC (Lindane)	0.0470	0.100	ug/L	73	125	20

E508 Water

Analyte	MDL	RL	Rep Units	LCL	UCL	RPD
Heptachlor	0.0460	0.100	ug/L	45	128	20
Heptachlor Epoxide	0.0870	0.100	ug/L	40	130	20
Hexachlorobenzene	0.0870	0.100	ug/L	40	130	20
Hexachlorocyclopentadiene	0.0870	0.100	ug/L	40	130	20
Methoxychlor	0.0550	0.100	ug/L	73	142	20
Propachlor	0.0480	0.100	ug/L	41	125	20
Toxaphene	0.0150	0.500	ug/L			
Trifluralin	0.0870	0.100	ug/L	40	130	20

E508 Water

Analyte	MDL	RL	Rep Units	LCL	UCL	RPD
PCB-1016	0.0000429	0.000200	ug/mL	54	125	20
PCB-1221	0.000149	0.000200	ug/mL	41	126	20
PCB-1232	0.0000518	0.000200	ug/mL	41	126	20
PCB-1242	0.0000437	0.000200	ug/mL	39	150	20
PCB-1248	0.0000552	0.000200	ug/mL	41	126	20
PCB-1254	0.0000633	0.000200	ug/mL	29	131	20
PCB-1260	0.0000422	0.000200	ug/mL	41	126	20

E524.2 Water

Analyte	MDL	RL	Rep Units	LCL	UCL	RPD
1,1,1,2-Tetrachloroethane	0.113	1.00	ug/L	70	130	20
1,1,1-Trichloroethane	0.0992	1.00	ug/L	70	130	20
1,1,1,2,2-Tetrachloroethane	0.0832	1.00	ug/L	70	130	31
1,1,2-Trichloroethane	0.0806	1.00	ug/L	70	130	20
1,1-Dichloroethane	0.0878	1.00	ug/L	70	130	20
1,1-Dichloroethene	0.200	1.00	ug/L	70	130	22
1,1-Dichloropropene	0.200	1.00	ug/L	70	130	20
1,2,3-Trichlorobenzene	0.0820	1.00	ug/L	70	130	20
1,2,3-Trichloropropane	0.0629	1.00	ug/L	70	130	20
1,2,4-Trichlorobenzene	0.0820	1.00	ug/L	70	130	20
1,2,4-Trimethylbenzene	0.0723	1.00	ug/L	70	130	20
1,2-Dibromo-3-Chloropropane	0.168	1.00	ug/L	70	130	28
1,2-Dibromoethane	0.135	1.00	ug/L	70	130	20
1,2-Dichlorobenzene	0.0832	1.00	ug/L	70	130	20
1,2-Dichloroethane	0.265	1.00	ug/L	70	130	20
1,2-Dichloropropane	0.0859	1.00	ug/L	70	130	20
1,3,5-Trimethylbenzene	0.101	1.00	ug/L	70	130	20
1,3-Dichlorobenzene	0.101	1.00	ug/L	70	130	20
1,3-Dichloropropane	0.0829	1.00	ug/L	70	130	20
1,4-Dichlorobenzene	0.0696	1.00	ug/L	70	130	20
2,2-Dichloropropane	0.484	1.00	ug/L	70	130	20
2-Chlorotoluene	0.0719	1.00	ug/L	70	130	20
4-Chlorotoluene	0.0826	1.00	ug/L	70	130	20
Benzene	0.0540	1.00	ug/L	70	130	21
Bromobenzene	0.0504	1.00	ug/L	70	130	20
Bromochloromethane	0.133	1.00	ug/L	70	130	20
Bromodichloromethane	0.174	1.00	ug/L	70	130	20



Laboratory and Method DLs

E524.2 Water

Analyte	MDL	RL	Rep Units	LCL	UCL	RPD
Bromoform	0.116	1.00	ug/L	70	130	20
Carbon Tetrachloride	0.0994	1.00	ug/L	70	130	20
Chlorobenzene	0.0745	1.00	ug/L	70	130	21
Chloroethane	0.0955	1.00	ug/L	70	130	20
Chloroform	0.220	1.00	ug/L	70	130	20
Dibromochloromethane	0.102	1.00	ug/L	70	130	20
Dichlorodifluoromethane	0.233	1.00	ug/L	70	130	23
Ethylbenzene	0.0723	1.00	ug/L	70	130	20
Hexachlorobutadiene	0.200	1.00	ug/L	70	130	20
Isopropylbenzene	0.0613	1.00	ug/L	70	130	20
Methyl Chloride	0.208	1.00	ug/L	70	130	20
Methyl bromide	0.128	1.00	ug/L	70	130	20
Methylene Chloride	0.386	2.00	ug/L	70	130	35
Methylene bromide	0.115	1.00	ug/L	70	130	23
Naphthalene	0.0800	1.00	ug/L	70	130	20
Sec-Butylbenzene	0.0574	1.00	ug/L	70	130	20
Styrene	0.0806	1.00	ug/L	70	130	51
Tetrachloroethylene	0.200	1.00	ug/L	70	130	20
Toluene	0.0736	1.00	ug/L	70	130	21
Trichloroethylene	0.0540	1.00	ug/L	70	130	24
Trichlorofluoromethane	0.138	1.00	ug/L	70	130	20
Vinyl Chloride	0.128	1.00	ug/L	70	130	20
cis-1,2-Dichloroethylene	0.200	1.00	ug/L	70	130	20
cis-1,3-Dichloropropene	0.0586	1.00	ug/L	70	130	20
m,p-Xylenes	0.127	2.00	ug/L	70	130	20
n-Butylbenzene	0.0809	1.00	ug/L	70	130	20
n-Propylbenzene	0.0647	1.00	ug/L	70	130	20
o-Xylene	0.107	1.00	ug/L	70	130	20
p-Cymene (p-Isopropyltoluene)	0.200	1.00	ug/L	70	130	20
tert-Butylbenzene	0.0923	1.00	ug/L	70	130	20
trans-1,2-dichloroethylene	0.0812	1.00	ug/L	70	130	20
trans-1,3-dichloropropene	0.0651	1.00	ug/L	70	130	20



Laboratory and Method DLs

E353.2 Water

Analyte	MDL	RL	Rep Units	LCL	UCL	RPD
Nitrate as N	0.100	0.100	mg/L	90	110	20
Nitrogen, Nitrate-Nitrite	0.0218	0.100	mg/L	90	110	20

E353.2 Water

Analyte	MDL	RL	Rep Units	LCL	UCL	RPD
Nitrite as NO ₂	0.0985	0.100	mg/L	90	110	20



Laboratory and Method DLs

SM4500-S-E Water

Analyte	MDL	RL	Rep Units	LCL	UCL	RPD
Sulfide, total	1.00	5.00	mg/L	75	120	20

Attachment B
Calibration Procedures

3.3 Calibration

To obtain correct measurement values, the sensors need to be calibrated using standard solution before measurement. You can select simultaneous auto calibration of the pH, COND and TURB sensors in pH4 standard solution and DO and DEP sensors simultaneously in air, or manual calibration of individual measurement parameters. You can check the result of the previous calibration using the procedure on “ 3.5.4 Checking the calibration record ” (page 70).

Note

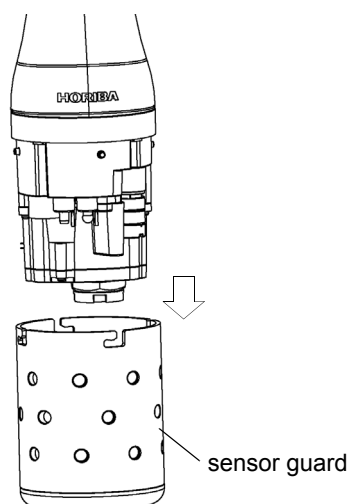
- Wait at least 20 minutes after turning the system power ON before calibrating the DO sensor.
- Make the DO and COND compensation settings before calibration since these settings are applied during calibration.
- You can select only the desired parameters for calibration and calibrate just those parameters (see “ 3.2.4 Sensor selection ” (page 25)).
- Use about 200 mL of standard solution in the calibration cup.
- Calibration data is stored in the sensor probe.

3.3.1 Auto calibration

Tip

- The following parameters are calibrated (at 25°C):
 pH: Set to 4.01 (zero-point calibration); the span is adjusted to the factory default value.
 COND: 0.449 S/m (4.49 mS/cm, span calibration); the zero point is adjusted to the factory default value.
 TURB: 0 NTU (zero-point calibration); the span is adjusted to the factory default value.
 DO: 8.92 mg/L (span calibration); the zero point is adjusted to the factory default value.
 DEP: 0 m (zero-point calibration); the zero point is adjusted to the factory default value.
- If the air temperature changes, the readout value may not be stable. Ensure that the ambient air temperature is the same temperature as the calibration solution, because the internal probe temperature sensor and external temperature sensor (in the calibration solution) are used for the auto calibration. Allow the probe and standard solution to equilibrate for 1 hour if a thermometer is not available to verify that these temperatures are the same.
- Do not hold the probe while performing the auto calibration. Body temperature may elevate the internal temperature sensor measurement creating DO calibration error.

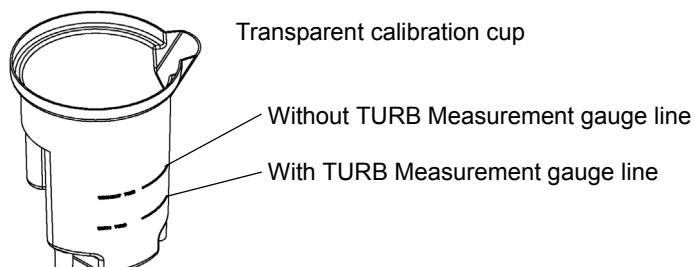
1. Remove the sensor guard and wash the sensor probe 2 or 3 times with deionized water.



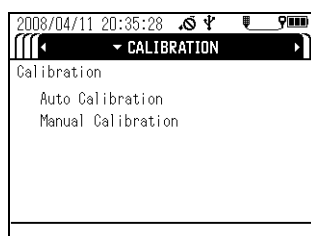
2. Remove the transparent calibration cup.

3. Fill the transparent calibration cup to the line with pH 4 standard solution.

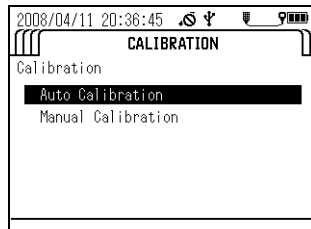
The transparent calibration cup has With TURB Measurement and Without TURB Measurement gauge lines.



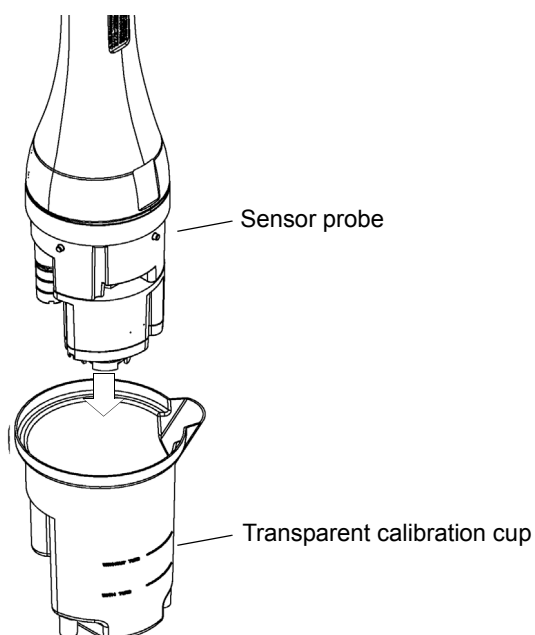
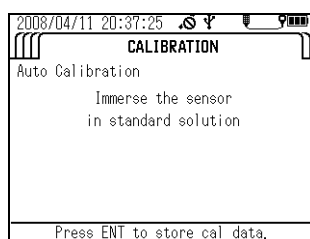
4. Press the control unit's CAL key to set the calibration mode.



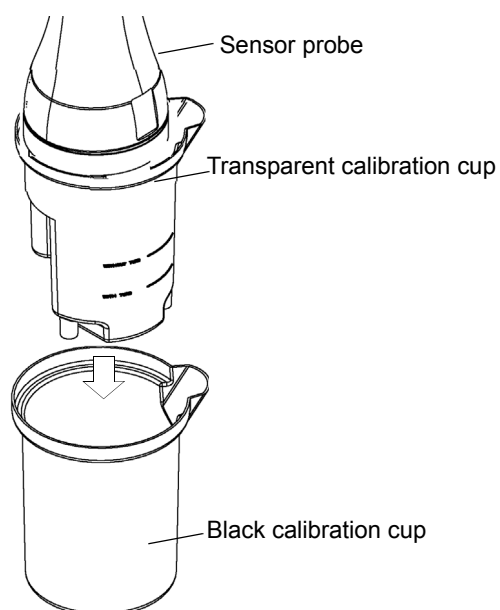
5. Press the down (▽) key to move the cursor to "Auto Calibration", then press the ENTER key.



6. Immerse the sensor probe in the transparent calibration cup. Check that the pH sensor, ORP sensor, reference electrode, COND sensor, TURB sensor and temperature sensor are submerged in the pH 4 standard solution and check that there are no air bubbles on the sensor.



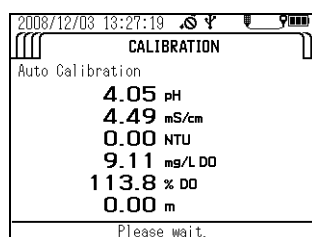
7. With the sensor probe still in the transparent calibration cup, place the transparent calibration cup into the black calibration cup.



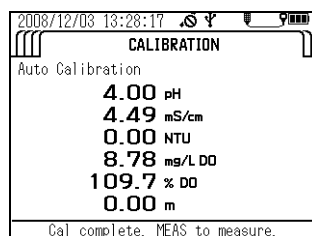
8. When all the sensor values have stabilized, press the ENTER key to start calibration.

Note

Do not remove the sensor probe from the calibration solution. U-53 turbidity data will display "----" until the calibration is completed.



Calibration is finished when the message "Cal complete. MEAS to measure." appears. Press the MEAS key to set the measurement screen, then start measurement.



If a calibration error occurs, start calibration after first resolving the issue according to the instructions in " 4.6 Troubleshooting " (page 89).

Attachment C

Field Sampling and Analysis Plan

Site Address: _____

Field Sampling Checklist

The following is a detailed discussion of the field sampling protocol.

1. Gather all appropriate field equipment.

- | | |
|---|--------------------------|
| • Laboratory Sample Kit with Chain of Custody | • Field Sampling Forms |
| • Pre-printed Labels | • Field Book |
| • Well Purging Apparatus | • Sampling Analysis Plan |
| • Water Quality Meter | • GPS Unit |
| • Tubing | • Camera |
| | • Butane Lighter |

2. Calibrate sampling equipment at beginning of day and in afternoon.

3. Review all supplied well construction information for well.

4. Take picture of the well and any pressure or storage tanks or treatment systems.

5. Collect GPS readings for well.

6. Locate sample port closest to well's pump/wellhead as possible.

Note: Faucets or taps used to collect water samples should be in good condition.

7. Remove any hoses, aerators, filters, or other devices from the faucet.

8. Connect the Y-split flow controller/Y-fitting to the selected faucet. The flow rate for the purge water discharge hose can be at the pump's capacity so that the well can be purged in a reasonable time frame.

9. Connect tubing to the other arm of the Y-fitting and attach it to the flow cell for field parameter measurements.

10. Start purging by opening the faucet and valves on the attached Y-split flow controller.

Note: If the sample faucet is located before any storage or pressure tanks, the purge time should be relatively short (5 minutes). If the sample faucet is located after a tank, then purge until enough water has flushed any standing water from the plumbing (approximately 10 minutes). Wells that are used infrequently should be given enough time to purge so that the plumbing is thoroughly flushed and field parameters have stabilized (15 minutes).

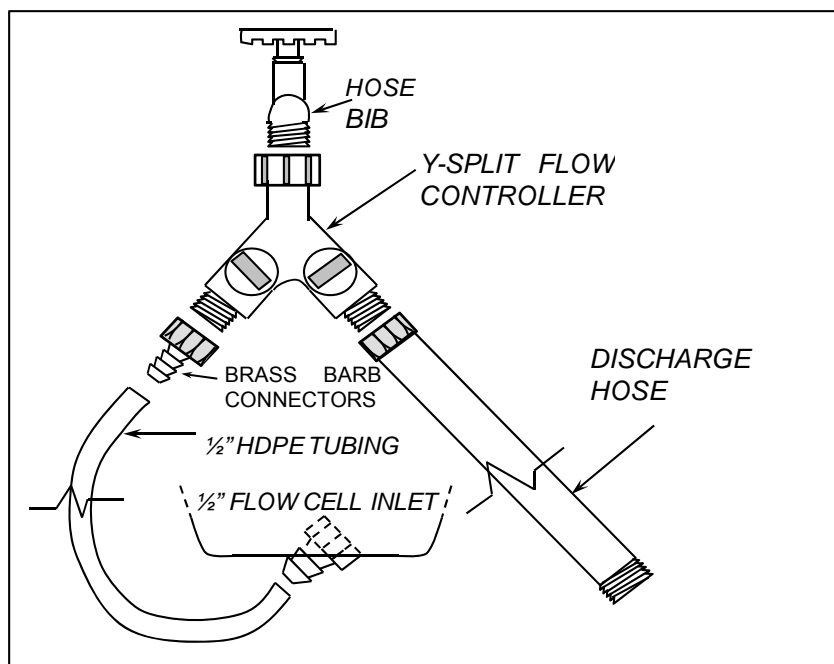


Figure 1 – Schematic for Typical Water Supply Well Purging Apparatus

11. Record the field parameter values, time of measurement, and the amount of purge water discharged. Note and provide qualifying remarks if parameter readings are anomalous or unstable due to instrument problems. Monitored field parameters include pH, specific conductance, dissolved oxygen, water temperature, and oxidation reduction potential. Turbidity should be stabilized at or below 10 NTUs.
12. Once field parameters stabilize collect samples. Purge and sample withdrawal should from a continuous process. Slowly reduce, but do not stop, the faucet flow rate. Use the Y-fitting valve to turn off the flow to the discharge hose. Maintain the flow through the flow cell side of the Y-fitting. Disconnect the hose from the flow cell and begin collecting the sample. Do not touch the tubing to the bottle while filling.
13. Samples should be collected in the following order:
 - VOCs (3 clear VOAs)
 - SVOCs (1-L Amber)
 - Dioxins (1-L Amber)
 - Metals (1-500 mL Plastic)
 - Other
14. Field duplicate samples will be collected one for every 10 samples.
15. Label sample containers and immediately place in a cooler on ice. Record sample date and time on the field data sheet.